RBC-NOS dependent NO production during RBC aging in healthy volunteers and type 2 diabetic patients

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The aim of the studies was to investigate red blood cell (RBC)-nitric oxide synthase (NOS) activation, NO production and RBC deformability in type 2 diabetics (T2DM) and healthy controls (HC) at baseline and the effects of endurance training on these parameters in T2DM with a special focus on in vivo RBC aging.

The parameters were measured at rest in HC and T2DM and in T2DM before and after a six week training intervention. RBC of all ages and RBC separated by density-gradient centrifugation were analyzed. RBC deformability was measured by ektacytometry, RBC-NOS activation was determined by immunohistochemical staining of the serine 1177 residue. RBC NO was determined by chemiluminescence detection.

Compared to HC, T2DM showed less young and more old RBC. EImax of RBC within the same age group was decreased although nitrite levels and RBC-NOS activation were higher. In T2DM, the proportion of young RBC was significantly higher post-training. EImax of RBC of all ages remained unaltered post-training. Detailed consideration of the different RBC fractions showed reduced EImax post-training especially in older RBC. RBC-NOS activation and NO production remained unaltered in RBC of all ages post-training but analysis of the different fractions revealed decreasing RBC-NOS activation and NO production in old RBC post-training. It remains to be investigated whether these changes in older RBC could lead to more rapid elimination of aged RBC, thus favoring the production of young RBC.